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lenses, on cylindrical rods, on bars, on tubes, on convertible pendulums, and on several clock pendulums, amounting to upwards of 40 in number. The results of these experiments give in each case a different value for the factor n ; and which appears to depend on the extent of surface, in proportion to the bulk of the body exposed to the direct action of the air when in motion: further experiments, however, are requisite to establish this point in a satisfactory manner*. But, in the author's opinion, enough is shown to indicate the necessity and propriety of a revision and correction of all the experiments hitherto made with the pendulum, either for the determination of its absolute length, or for ascertaining the true figure of the earth; and that for this purpose, the true correction must be found from actual experiment in each particular case; since, with very few exceptions, it cannot be determined by any mathematical deduction.

Mr. Baily then proceeds to point out some singular discordances arising from the knife-edge mode of suspending the pendulum, where the *same* knife-edge and the *same* agate planes are employed. From which he is led to infer that the pendulum furnished with a knife-edge and agate planes, as at present constructed, is a very inadequate instrument for the delicate purposes for which it was originally intended; and that a more rigid examination of that part of the instrument is requisite, before we can rely with confidence on the accuracy of the results obtained by it.

Some anomalies are then pointed out in the magnitude of the arc of vibration, and some remarks offered on the supposed inadequacy of the usual formula for determining the correction for the arc; but the author considers it desirable that further experiments should be made for the more accurate determination of this point.

In conclusion, the author expresses a doubt of the rigid accuracy of the length of the seconds pendulum, as deduced from the recent experiments of Captain Sabine.

To the whole are appended tables exhibiting the details of all the experiments made by the author, and the corresponding results.

A Paper was read, entitled, "Researches in Physical Astronomy," by John William Lubbock, Esq. V.P. and Treas. R.S.

The present paper contains some further developments of the theory of the moon, which are given at length, in order to save the trouble of the calculator, and to avoid the danger of mistake. The author remarks, that while it seems desirable, on the one hand, to introduce into the science of physical astronomy a greater degree of uniformity, by bringing to perfection a theory of the moon founded on the integration of the equations employed in the planetary theory, it

* Since this paper was read, the author has made a number of additional experiments on various other pendulums, which, by permission of the Council, will form part of the original paper; and from which he is led to infer that, in the case of spheres, cylinders, and other bodies suspended by rods of different diameters, the value of the factor depends not only on the body appended to such rod, but that the rod itself has a considerable influence on the result, except it be a very fine wire; when its effect becomes merged in that of the appended body.

is also no less important, on the other hand, to complete, in the latter, the method hitherto applied solely to the periodic inequalities. Hitherto those terms in the disturbing function which give rise to the secular inequalities, have been detached, and the stability of the system has been inferred by means of the integration of certain equations, which are linear when the higher powers of the eccentricities are neglected; and from considerations founded on the variation of the elliptic constants. But the author thinks that the stability of the system may be inferred also from the expressions which result at once from the direct integration of the differential equations. The theory, he states, may be extended, without any analytical difficulty, to any power of the disturbing force, or of the eccentricities, admitting the convergence of the series; nor does it seem to be limited by the circumstance of the planet's moving in the same direction.

A Paper was also read, entitled, "On the Nervous System of the *Sphinx Ligustri* (Linn.), and on the Changes which it undergoes during a part of the Metamorphoses of the Insect," by George Newport, Esq. Communicated by Peter Mark Roget, M.D. Sec. R.S.

The author gives a minute anatomical description, accompanied by drawings, of the development and arrangement of the nerves of the *Sphinx Ligustri*, and the successive changes they undergo during the last stage of the larva, and the earlier stages of the pupa state. As this insect, in passing from its larva to its perfect state, remains for several months in a torpid condition, it affords a better opportunity of minutely following these changes, and of ascertaining in what manner they are effected, than most other insects; and the great comparative size of this species renders the investigation still more easy.

While in its larva state, this insect frequently changes its skin: it enlarges rapidly in size after each operation, and the nervous system undergoes a corresponding development. The author minutely describes the longitudinal series of ganglia, which extend the whole length of the animal. He remarks that the eleventh or terminal ganglion is distinctly bilobate, a form which, as suggested to him by Dr. Grant, is probably acquired by the consolidation of two ganglia which had been separate at an earlier period of development. A detailed account is then given of the nerves proceeding from these several ganglia.

During the change from the state of larva to that of the perfect insect, the number of the ganglia is found to diminish in consequence of the approximation and conjunction of adjacent ganglia; and the nervous cords which connect them are generally much shortened. A nerve is described which, from the mode of its distribution to the stomach, intestinal canal, and dorsal vessel, presents a remarkable analogy to the *par vagum*, or pneumogastric nerve of vertebrated animals; so that the author considers it probable that its functions are somewhat similar to this nerve; as has, indeed, been already conjectured by Straus-Dürckheim. Another division of nerves exist, which, from the principal branches derived from each abdominal plexus being always distributed among the tracheæ, near the spiracles, are perhaps analogous to the sympathetic system of nerves of the higher classes of animals.